

## CLAIMS

- 1 1. Apparatus comprising  
2 two or more electronic components, each of the  
3 components having  
4 an internal circuit having a controlled element and a  
5 control element, and  
6 terminals coupled to the internal circuit and adapted  
7 for surface mounting on a circuit board,  
8 the internal circuits of the components being  
9 adapted to be connected in parallel through one of the terminals of  
10 each of the internal circuits to a common point of an external  
11 circuit and to cooperatively protect the external circuit against  
12 occurrence of an adverse electrical event,  
13 wherein none of the electronic components has ratings  
14 sufficient by itself to protect the external circuit.
- 1 2. The apparatus of claim 1 in which the event comprises a  
2 loss of a source of power for the external circuit.
- 1 3. The apparatus of claim 1 in which the event comprises a  
2 sudden change in a voltage at a point of load of the external circuit.
- 1 4. The apparatus of claim 1 in which the controlled element  
2 comprises a FET.

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1 5. The apparatus of claim 1 in which the internal circuit is  
2 adapted to detect a current reversal in a path between a power  
3 source and the external circuit, and the controlled element is  
4 controlled to disconnect the power source from the external circuit  
5 in response to the detection.

1 6. The apparatus of claim 1 in which the internal circuits are  
2 connected in parallel between a single power source and the  
3 external circuit.

1 7. The apparatus of claim 1 in which each of the internal  
2 circuits includes a voltage generator adapted to derive power from  
3 an external source and to provide a voltage to drive the internal  
4 circuit.

1 8. The apparatus of claim 1 in which each of the internal  
2 circuits includes a comparator that compares the voltages at the  
3 common point and at another point to determine when a current  
4 has reversed.

1 9. The apparatus of claim 1 in which the internal circuit  
2 comprises a FET and a control circuit connected to control the  
3 FET.

1 10. The apparatus of claim 9 in which the FET and the control  
2 circuit are formed on a single integrated substrate.

1 11. The apparatus of claim 9 in which the FET and the control  
2 circuit comprise discrete components mounted on a single  
3 substrate.

1 12. The apparatus of claim 10 or 11 in which the FET, the  
2 control circuit, and the terminals are part of a micro-lead package.

1 13. The apparatus of claim 1 in which the internal circuit  
2 includes elements adapted to pull up a voltage at one of the  
3 terminals when the voltage at the terminal drops and elements  
4 adapted to pull down the voltage at the one of the terminals when  
5 the voltage at the terminal rises.

1 14. The apparatus of claim 13 in which the elements comprise  
2 a DC-to-DC converter.

1 15. Apparatus for providing a filtering function to an external  
2 circuit comprising

3 a controlled element,

4 a control element for controlling the voltage across the  
5 controlled element such that the average voltage across the  
6 controlled element changes with variations in the signal that is to  
7 be filtered.

1 16. The apparatus of claim 15 in which the external circuit  
2 comprises a power converter, and the filtering function comprises  
3 ripple filtering of a power converter.

1 17. The apparatus of claim 16 in which the filtering function  
2 comprises attenuating the ripple generated at an output of the  
3 converter.

1 18. The apparatus of claim 16 in which the filtering function  
2 comprises attenuating the ripple generated at an input of the  
3 converter.

1 19. The apparatus of claim 15 in which the controlled element  
2 comprises a FET the conductivity of which is controlled to provide  
3 the filtering function.

1 20. The apparatus of claim 15 in which the control element  
2 includes elements adapted to detect a component of ripple at one of  
3 the terminals.

1 21. The apparatus of claim 20 in which the controlled element  
2 comprises a MOSFET, and the average voltage across the  
3 MOSFET is controlled to be greater than the peak-to-peak  
4 variation in the ripple.

1 22. The apparatus of claim 20 in which the control regime  
2 includes regulating the voltage variations across the FET to effect  
3 ripple attenuation.

1 23. The apparatus of claim 15 further comprising  
2 terminals coupled to the apparatus and adapted for surface  
3 mounting on a circuit board.

1 24. The apparatus of claim 15 in which the controlled element  
2 and the control element are formed as a circuit integrated on a  
3 single substrate.

1 25. Apparatus comprising  
2 a protection circuit, and  
3 terminals for connecting the protection circuit respectively  
4 to a power source and to an external circuit that is to be powered  
5 by the source and protected by the protection circuit against an  
6 occurrence of an electrical event,



